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GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
CENTRAL GROUND WATER BOARD

PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN DORNALA MANDAL, PRAKASAM DISTRICT, ANDHRA PRADESH STATE

SOUTHERN REGION
HYDERABAD
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PLAN ON
ARTIFICIAL RECHARGE TO GROUNDWATER AND WATER CONSERVATION IN DORNALA MANDAL, PRAKASAM DISTRICT, ANDHRA PRADESH STATE

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AT A GLANCE

Name of the Mandal	DORNALA
District	PRAKASAM
State	ANDHRA PRADESH
Total Area sq.km.	906
Area suitable for Artificial Recharge (sq.km.)	255
Latitude and Longitude	15.663680 to 16.039080 and 78.802430 to 79.223790.
Average Annual Rainfall (mm)	860
Geology	Shale and Quartzite
Average Depth To Water Level (Decadal) (Pre Monsoon)	5.4
Average Depth To Water Level (Decadal) (Post Monsoon)	1.6
Ground Water Resources (2011)	
Annual Replenishable Ground Water Resources (MCM/yr)	12.97
Net Annual Ground Water Availability(MCM)/yr	11.67
Net Annual Ground Water Draft(MCM)/yr	12.37
Projected Demand for Domestic and Industrial Use(MCM)/yr	0.19
Stage of Ground Water Development (%)	106
Surface runoff available (MCM)/yr	48.15
Total Storage Created in the Mandal by Various Agencies (MCM)/yr	1.08
Artificial Recharge/Conservation Measures	
Recharge Structures Proposed (No.s)	Percolation Tanks: 66, Check Dams: 181 Farm ponds: 380, Recharge Shafts: 76
Improving Water use Efficiency	Micro Irrigation System -1900 ha
Tentative Total Cost in Lakhs (Rs.)	3347.82
Expected Recharge/Savings (MCM)/yr	15.336

1. INTRODUCTION

Dornala Mandal is one of over-exploited mandal in Prakasham district, Andhra Pradesh State, which is economically backward and chronically drought affected. The mandal has 19 inhabited villages and with 11 gram panchayats.

2. LOCATION

The mandal lies between north latitudes 15.663680 to 16.039080 and between east longitudes 78.802430 to 79.223790. The mandal occupies the western part of the Prakasham district and is bounded on the north by Yerragondapalem mandal, on the east by Peddaraveedu mandal, on the south by Ardhaveedu mandal and west by Kurnool district. (Fig.1) The geographical area of the mandal is 906 sq.km.

3. PHYSIOGRAPHY AND DRAINAGE:

The area is drained by streams which are tributaries of Musi river. The streams are mostly ephemeral in nature. The drainage pattern is dendritic, rectangular to sub rectangular due to the influence of geological structures. (Fig.2)

4. RAINFALL

The average rainfall in the mandal is 860 mm. The rainfall during the South -west monsoon season i.e., June-September accounts for about 85% of the total rainfall.

5. LAND USE PATTERN

Out of the total geographical area of 906 sq.km, the area covered by forest is 582.65 sq.km and the net area sown is 45.14 sq.km. Barren and uncultivable land is 25.61 sq.km. The land for non agricultural use accounts for 26.84 sq.km. (Fig.3)

6. HYDROGEOLOGY

The area is underlain by Meta sedimentary formations comprising of Shales and Lime stones of Pre-Cambrian age (Fig.4). Ground water occurs in weathered and fractured zones under water table and semi- confined conditions. The weathered zone thickness as per the GEC report is 30 m. The weathered zone has been extensively tapped by dug and dug cum bore wells upto 20 m depth, which are mostly dry now. Ground water occurs in the fractured rock formations up to 200 m bgl. However, the potential fractures are encountered between 50-100 m bgl. The cumulative yield varies from 2-5 lps.

7. GROUND WATER LEVEL SCENARIO

The depth to water level during the pre-monsoon and post-monsoon varies from 5 to 10 m. The decadal mean water level trend during post monsoon is depicted in the Fig.-5

8. DYNAMIC GROUND WATER RESOURCES

The Ground water availability, Utilization and stage of Development in Dornala Mandal Prakasham District is given in Table-1.

Table-1: Ground water resources of Dornala mandal, Prakasham district.

Annual Replenishable Ground water resources (MCM)	12.97
Net Annual Ground Water Availability(MCM)/yr	11.67
Net Annual Ground Water Draft(MCM)/yr	12.37
Projected Demand for Domestic and Industrial use up to 2025. (MCM)	0.19
Stage of Ground water development (%).	106
Whether notified or not with year of notification.	No

9. NEED FOR ARTIFICIAL RECHARGE AND CONSERVATION METHODS

The ground water withdrawal is more than the recharge with a stage of development above hundred percent. The long term water level trend mostly shows a declining trend and the water levels are very deep ranging up to 15 m. The sustainability of bore wells has become questionable as many bore wells are either drying up or have recorded reduced yields. There is no surface water irrigation facility in the area. All these factors indicate that there is an urgent need for artificial recharge and water conservation in the Mandal.

10. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Dornala Mandal falls under high stage of ground water development i.e., 106 % and with sufficient amount of uncommitted surface runoff. The area is completely dependent on ground water for domestic, industrial and irrigation purposes. During the monsoons runoff quickly flows out of the area without natural recharge to ground water. It is necessary to apply artificial recharge techniques to allow more and more recharge through check dams, PTs, MPTs, farm ponds, recharge shafts to cope up with the withdrawal pattern and also to improve ground water situation through various interventions including on farm activities and micro irrigation systems (Sprinkler-Drip-HDPE).

11. AVAILABILITY OF SURPLUS, SURFACE WATER FOR ARTIFICIAL RECAHRGE OR CONSERVATION

The runoff was calculated by taking into account of normal rainfall of the mandal and corresponding runoff yield from Strangers table. The existing storage created by various artificial recharge structures constructed by the State Government, if any, was deducted for calculating the runoff yield to recommend new AR structures.

Total Geographical area (Sq.kms)	906
Hilly Area (Sq.kms)	651
Area suitable for Artificial Recharge (sq.km.)	255
Runoff Yield in MCM/yr.	48.15
Existing No. of Check Dams	116
Storage created MCM/yr.	0.82
Existing No. of Percolation Tanks	36
Storage created MCM/yr.	0.25
Total Existing Storage Created	1.08

12. FEASIBLE ARTIFICIAL RECHARGE STRUCTURES

Since the mandal is categorized as over exploited, there is an immediate need for improving ground water scenario and to ensure sustainability of ground water sources. It is also suggested to create additional storage capacity of surface water bodies which would result in supplementing irrigation thereby reducing the ground water draft. The run off available in the mandal has been assessed as 47.07 MCM/yr, which could be considered for further planning of artificial recharge. However, the number of artificial recharge structures feasible has been recommended in areas, by considering the utilizable yield, number of existing structures, land use, drainage pattern and also where the post monsoon water levels (decadal mean) are more than 5 m bgl., and or decadal trends are either falling or showing insignificant raising trend.

A) Check dams and Percolation Tanks

The area is covered by seasonal nalas – drains, which carry discharge during monsoon period along with silt load and debauched into the water bodies within a short duration. It is proposed to identify such nalas for construction of check dams/Percolation tank with recharge shafts, so as to harness ground water and to increase soil moisture content.

- The site selected for check dam/Percolation Tank should have sufficient thickness of permeable soils or weathered material to facilitate recharge of stored water within a short span of time. The water stored in these structures is mostly confined to the stream course and height is normally less than 2m.

- These are designed based on stream width and excess water is allowed to flow over the crest wall. In order to avoid scouring from excess runoff water cushions are provided on the downstream side. To harness maximum runoff in the stream, a series of such check dams can be constructed to have recharge on a regional scale.

- Considering the annual monsoon rainfall of 860 mm, sufficient rain water can be harnessed. This will improve ground water regime as well as delaying the instant flow into the main river.

- The flow in these seasonal rivers can be sustained up to about 2 to 3 months after monsoon.
- Recharge trenches can also be constructed along upstream side of the check dam/Percolation Tank in the impoundment area for enhancing the ground water recharge rate.

Thus, a total of 181 **Check dams and 66 Percolation tanks** are recommended.

B). Recharge Shafts

The existing check dams and percolation tanks lose their storage capacity as well as recharge capacity due to siltation. Hence, Recharge shafts are recommended in the existing Check dams and Percolation tanks to enhance the ground water recharge. During the heavy downpours, there will be sufficient accumulation of runoff, which can also effectively be utilized for recharge by constructing recharge shafts. Hence, it is proposed to construct 58 and 18 recharge shafts of 165 mm dia with 30 m depth in the existing check dams and percolation tanks respectively.

C). Farm Ponds

A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rain water and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth depend on the amount of land available; the type of soil water from the farm pond is conveyed to the fields manually, by pumping, or by both methods.

Advantages of Farm Ponds

- They provide water to start growing crops, without waiting for rain to fall.
- They provide irrigation water during dry spells between rainfalls. This increases the yield, the number of crops in one year, and the diversity of crops that can be grown.
- Bunds can be used to raise vegetables and fruit trees, thus supplying the farm household with an additional source of income and of nutritious food.
- Farmers are able to apply adequate farm inputs and perform farming operations at the appropriate time, thus increasing their productivity and their confidence in farming.
- They check soil erosion and minimize siltation of waterways and reservoirs.
- They supplies water for domestic purposes and livestock.
- They promote fish rearing.
- They recharge the ground water.

- They improve drainage.
- The excavated earth has a very high value and can be used to enrich soil in the fields, levelling land, and constructing farm roads.

As per the Land use classification, majority of the area is covered by the agricultural field. Hence, it is proposed to construct 380 farm ponds in 19 villages of the Mandal @ 20 farm ponds in each village.

D). Micro Irrigation System (Sprinkler /drip/HDPE pipes)

Micro irrigation is defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery line.

In flood/furrow irrigation method more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation and it leaches out the nutrients from the plant. While through drip & sprinkler irrigation wastages of irrigational water could be minimized. The studies on different crops, has revealed that irrigation water is saved drastically. The conveyance losses (mainly seepage & evaporation) can be saved up to 25 to 40% through utilization of HDPE pipes. Initially the scheme is proposed to be implemented in worst affected areas showing deepest water levels and significant declining trends. It is proposed to take up micro irrigation system in 1900 ha @ 100 ha per village.

13. TENTATIVE COST ESTIMATES (DORNALA MANDAL)

S.No.	Feasible Artificial Recharge & Water Conservation structures/	No. of Structures/ Quantity	Total Volume (MCM)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs Lakh)	Expected Annual GW recharge/ savings (MCM)
1	Proposed Masonry Check dams Crest Length -10-15 m, Height-1-2 m) (0.007 MCM*4 fillings)	181	5.068	5	905	3.801
2	Recharge shaft in Check dam (50% of the existing Check dams)	58	0.638	0.5	29	0.638
3	Proposed Percolation Tanks (100*100*2.5)* 4 fillings)	66	6.6	15	990	4.95
4	Renovation Desilting, Repairs and installation of Recharge Shafts in existing PTS (50% of the existing PTS)	18	0.198	1	18	0.198
5	Proposed Farm Pond (6 filling) 5*5*1.5 dimension @ 20 farm ponds per each village	380	0.05472	0.25	95	0.049248
6	Proposed Sprinkler/drip/HDPE pipes for 100 ha in each village	1900	11.4	0.6	1140	5.7
7	Proposed Piezometers up to 50 mbgl @ one PZ per Village	19	0	0.6	11.4	0
8 (i)	Total (No. of AR Structures)	722	12.56		2048.4	9.636
8 (ii)	Total (ha)	1900			1140	5.7
	Total (8(i) + 8 (ii))				**3188.4**	**15.336**
9	Impact Assessment & O & M 5 % of Total cost of the Scheme				**159.42**	
	Grand Total				**3347.82**	

*(Expected annual GW Recharge/Savings MCM - CDS& PTS: 75%, Farm ponds - 90%, Sprinklers-50%, Recharge shafts in existing CDS and PTS-100%)

Note: The type, number and cost of structure may vary according to site, after the ground truth verification.

14. TIME SCHEDULE

Steps	Quarters							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Identification of line department/implementing agency and preparation of DPR								
Approval of Scheme and releases of sanction of funds								
Implementation of ARS								

Phase = one quarter or 3 months or equivalent to financial quarter

A). Operation and Maintenance

In all projects impact assessment has to be carried out to ensure that project is economically viable, socially equitable and environmentally sustainable by inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Accordingly it is proposed to have impact assessment as well as operation & Maintenance at the rate of 5% of the total cost of the project for 5 years from the completion of artificial recharge project.

B). Expected Benefits

The benefits of the project are:

1. The implementation of the project would result in additional recharge/Ground water savings to the tune of 15.336 MCM.
2. Ground water recharge will help in arresting the rapid decline in ground water resources and will also ensure improvement in quality of ground water by dilution.
3. Proposed structures and measures will also enhance the ground water potential and would ensure sustainability of ground water resources. It is estimated that the stage of ground water development may likely to be reduced from the present 106% to 45% (61%)
4. It will also help in controlling soil erosion.

Acknowledgements

The data received from the Director Ground Water Department Andhra Pradesh in respect of the basic inputs is duly acknowledged. The information on existing Artificial Recharge Structures have been taken from the EMUSTER, Department of Rural Development, Government of AP.

EXISTING ARTIFICIAL RECHARGE STRUCTURES
DORNALA MANDAL, PRAKASHAM DISTRICT, AP.

S.no	Gram Panchayat	Habitation	Structure Type	Longitude	Latitude	Scheme
1	China dornala	China Dornala	Check Dam	79.1309	15.8784	NREGS
2	China dornala	China Dornala	Check Dam	79.1344	15.8789	NREGS
3	China dornala	China Dornala	Check Dam	79.1352	15.8795	NREGS
4	China dornala	China Dornala	Check Dam	79.1278	15.8910	NREGS
5	China dornala	China Dornala	Check Dam	79.1341	15.8892	NREGS
6	Chinagudipadu	Chinagudipadu	Check Dam	79.1447	15.9023	NREGS
7	Chinagudipadu	Chinagudipadu	Check Dam	79.1567	15.8991	NREGS
8	Chinagudipadu	Chinagudipadu	Check Dam	79.1562	15.9022	NREGS
9	Chinagudipadu	Chinagudipadu	Check Dam	79.1470	15.8854	NREGS
10	Chinagudipadu	Chinagudipadu	Check Dam	79.1477	15.8840	NREGS
11	Ramachandra kota	Ramachandra Kota	Check Dam	79.1555	15.8654	NREGS
12	Ramachandra kota	Ramachandra Kota	Check Dam	79.1674	15.8607	NREGS
13	Ramachandra kota	Ramachandra Kota	Check Dam	79.1617	15.8766	NREGS
14	Yadavalli	Yadavalli	Check Dam	79.0657	15.9211	NREGS
15	Yadavalli	Yadavalli	Check Dam	79.0500	15.9165	NREGS
16	Yadavalli	Yadavalli	Check Dam	79.0611	15.9063	NREGS
17	Jammidornala	Jammidornala	Check Dam	79.1212	15.9179	NREGS
18	Jammidornala	Jammidornala	Check Dam	79.1278	15.9112	NREGS
19	Jammidornala	Jammidornala	Check Dam	79.1259	15.9127	NREGS
20	Jammidornala	Jammidornala	Check Dam	79.1276	15.9092	NREGS
21	Kata kani palli	Kata Kani Palli	Check Dam	79.1138	15.8597	NREGS
22	Kata kani palli	Kata Kani Palli	Check Dam	79.1167	15.8591	NREGS
23	Kata kani palli	Kata Kani Palli	Check Dam	79.1125	15.8574	NREGS
24	Kata kani palli	Kata Kani Palli	Check Dam	79.1138	15.8567	NREGS
25	Kata kani palli	Kata Kani Palli	Check Dam	79.1146	15.8568	NREGS
26	Kata kani palli	Kata Kani Palli	Check Dam	79.1163	15.8564	NREGS
27	Peda bommala puram	Chattuthanda	Check Dam	79.0841	15.9486	NREGS
28	Peda bommala puram	Chattuthanda	Check Dam	79.0797	15.9464	NREGS
29	Peda bommala puram	Chattuthanda	Check Dam	79.0603	15.9460	NREGS
30	Peda bommala puram	Chattuthanda	Check Dam	79.0634	15.9456	NREGS
31	Peda bommala puram	Chattuthanda	Check Dam	79.0664	15.9452	NREGS
32	Peda bommala puram	Chattuthanda	Check Dam	79.0702	15.9461	NREGS
33	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1204	15.9448	NREGS
34	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1075	15.9444	NREGS
35	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1044	15.9460	NREGS
36	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1535	15.9418	NREGS
37	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1579	15.9383	NREGS
38	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1518	15.9306	NREGS
39	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1594	15.9282	NREGS

40	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1590	15.9432	NREGS
41	Peda bommala puram	Peda Bommala Puram	Check Dam	79.0975	15.9476	NREGS
42	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1002	15.9458	NREGS
43	Peda bommala puram	Peda Bommala Puram	Check Dam	79.1476	15.9472	NREGS
44	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0074	15.8845	NREGS
45	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0060	15.8826	NREGS
46	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0010	15.8711	NREGS
47	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0057	15.8836	NREGS
48	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0047	15.8836	NREGS
49	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0050	15.8837	NREGS
50	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0091	15.8926	NREGS
51	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0121	15.8963	NREGS
52	Yeguva cherlo palli	Chilakacherla	Check Dam	79.0121	15.8964	NREGS
53	Yeguva cherlo palli	Yeguva Cherlo Palli	Check Dam	78.9511	15.8680	NREGS
54	Yeguva cherlo palli	Yeguva Cherlo Palli	Check Dam	78.9598	15.8901	NREGS
55	Yeguva cherlo palli	Yeguva Cherlo Palli	Check Dam	78.9565	15.8867	NREGS
56	Yeguva cherlo palli	Yeguva Cherlo Palli	Check Dam	78.9664	15.9003	NREGS
57	Yeguva cherlo palli	Yeguva Cherlo Palli	Check Dam	78.9689	15.9064	NREGS
58	Peda dornala	Ayinamukkala	Check Dam	79.0868	15.9030	NREGS
59	Peda dornala	Ayinamukkala	Check Dam	79.0885	15.9017	NREGS
60	Peda dornala	Ayinamukkala	Check Dam	79.0693	15.9201	NREGS
61	Peda dornala	Ayinamukkala	Check Dam	79.0562	15.9250	NREGS
62	Peda dornala	Ayinamukkala	Check Dam	79.0595	15.9239	NREGS
63	Peda dornala	Kadavaraju Palli	Check Dam	79.0813	15.9029	NREGS
64	Peda dornala	Kadavaraju Palli	Check Dam	79.0782	15.9017	NREGS
65	Peda dornala	Kadavaraju Palli	Check Dam	79.0690	15.8985	NREGS
66	Peda dornala	Kadavaraju Palli	Check Dam	79.0692	15.8992	NREGS
67	Peda dornala	Kadavaraju Palli	Check Dam	79.0702	15.9010	NREGS
68	Peda dornala	Kadavaraju Palli	Check Dam	79.0674	15.8957	NREGS
69	Peda dornala	Kadavaraju Palli	Check Dam	79.0645	15.8886	NREGS
70	Peda dornala	Kadavaraju Palli	Check Dam	79.0706	15.8864	NREGS
71	Peda dornala	Thimmapuram	Check Dam	79.0999	15.8877	NREGS
72	Nallaguntla	Nallaguntla	Check Dam	78.9138	15.8613	NREGS
73	Nallaguntla	Nallaguntla	Check Dam	78.9364	15.8813	NREGS
74	Nallaguntla	Nallaguntla	Check Dam	78.9133	15.8611	NREGS
75	Pedda dornala	Dornala	Check Dam	79.1120	15.8982	NREGS
76	Pedda dornala	Dornala	Check Dam	79.1032	15.9014	NREGS
77	Pedda dornala	Dornala	Check Dam	79.0979	15.9200	NREGS
78	Pedda dornala	Dornala	Check Dam	79.0963	15.9197	NREGS
79	Pedda dornala	Dornala	Check Dam	79.1013	15.9205	NREGS
80	Gantavari palli	Gantavari Palli	Check Dam	79.0350	15.9180	NREGS
81	Gantavari palli	Gantavari Palli	Check Dam	79.0313	15.9188	NREGS
82	Gantavari palli	Gantavari Palli	Check Dam	79.0391	15.9181	NREGS

83	Gantavari palli	Gantavari Palli	Check Dam	79.0421	15.9185	NREGS
84	Gantavari palli	Gantavari Palli	Check Dam	79.0462	15.9187	NREGS
85	Gantavari palli	Kothur	Check Dam	78.9942	15.9113	NREGS
86	Gantavari palli	Kothur	Check Dam	78.9987	15.9134	NREGS
87	Gantavari palli	Kothur	Check Dam	78.9889	15.9162	NREGS
88	Chinagudipadu	Chinagudipadu	Check Dam	79.1447	15.9023	IWMP
89	Chinagudipadu	Chinagudipadu	Check Dam	79.1567	15.8991	IWMP
90	Chinagudipadu	Chinagudipadu	Check Dam	79.1562	15.9022	IWMP
91	Chinagudipadu	Chinagudipadu	Check Dam	79.1470	15.8854	IWMP
92	Chinagudipadu	Chinagudipadu	Check Dam	79.1477	15.8840	IWMP
93	Yadavalli	Yadavalli	Check Dam	79.0657	15.9211	IWMP
94	Yadavalli	Yadavalli	Check Dam	79.0500	15.9165	IWMP
95	Yadavalli	Yadavalli	Check Dam	79.0611	15.9063	IWMP
96	Peda dornala	Ayinamukkala	Check Dam	79.0868	15.9030	IWMP
97	Peda dornala	Ayinamukkala	Check Dam	79.0885	15.9017	IWMP
98	Peda dornala	Ayinamukkala	Check Dam	79.0693	15.9201	IWMP
99	Peda dornala	Ayinamukkala	Check Dam	79.0562	15.9250	IWMP
100	Peda dornala	Ayinamukkala	Check Dam	79.0595	15.9239	IWMP
101	Peda dornala	Kadavaraju Palli	Check Dam	79.0813	15.9029	IWMP
102	Peda dornala	Kadavaraju Palli	Check Dam	79.0782	15.9017	IWMP
103	Peda dornala	Kadavaraju Palli	Check Dam	79.0690	15.8985	IWMP
104	Peda dornala	Kadavaraju Palli	Check Dam	79.0692	15.8992	IWMP
105	Peda dornala	Kadavaraju Palli	Check Dam	79.0702	15.9010	IWMP
106	Peda dornala	Kadavaraju Palli	Check Dam	79.0674	15.8957	IWMP
107	Peda dornala	Kadavaraju Palli	Check Dam	79.0645	15.8886	IWMP
108	Peda dornala	Kadavaraju Palli	Check Dam	79.0706	15.8864	IWMP
109	Peda dornala	Thimmapuram	Check Dam	79.0999	15.8877	IWMP
110	Pedda dornala	Dornala	Check Dam	79.1120	15.8982	IWMP
111	Pedda dornala	Dornala	Check Dam	79.1032	15.9014	IWMP
112	Pedda dornala	Dornala	Check Dam	79.0979	15.9200	IWMP
113	Pedda dornala	Dornala	Check Dam	79.0963	15.9197	IWMP
114	Pedda dornala	Dornala	Check Dam	79.1013	15.9205	IWMP
115	Ramachandra kota	Ramachandra Kota	Check Wall	79.1597	15.8711	NREGS
116	Ramachandra kota	Ramachandra Kota	Check Wall	79.1669	15.8596	NREGS
117	China dornala	China Dornala	MPT	79.1241	15.8787	NREGS
118	China dornala	China Dornala	MPT	79.1258	15.8891	NREGS
119	Ramachandra kota	Ramachandra Kota	MPT	79.1507	15.8590	NREGS
120	Ramachandra kota	Ramachandra Kota	MPT	79.1561	15.8538	NREGS
121	Ramachandra kota	Ramachandra Kota	MPT	79.1644	15.8629	NREGS
122	Yadavalli	Yadavalli	MPT	79.0629	15.9188	NREGS
123	Jammidornala	Jammidornala	MPT	79.1200	15.9211	NREGS
124	Jammidornala	Jammidornala	MPT	79.1441	15.9253	NREGS
125	Peda bommala puram	Chattuthanda	MPT	79.0906	15.9471	NREGS

126	Peda bommala puram	Chattuthanda	MPT	79.0836	15.9474	NREGS
127	Peda bommala puram	Chattuthanda	MPT	79.0778	15.9456	NREGS
128	Peda bommala puram	Chattuthanda	MPT	79.0536	15.9460	NREGS
129	Peda bommala puram	Chattuthanda	MPT	79.0686	15.9472	NREGS
130	Peda bommala puram	Peda Bommala Puram	MPT	79.1063	15.9422	NREGS
131	Peda bommala puram	Peda Bommala Puram	MPT	79.1049	15.9418	NREGS
132	Peda bommala puram	Peda Bommala Puram	MPT	79.1053	15.9458	NREGS
133	Peda bommala puram	Peda Bommala Puram	MPT	79.0973	15.9458	NREGS
134	Yeguva cherlo palli	Yeguva Cherlo Palli	MPT	78.9534	15.8658	NREGS
135	Peda dornala	Ayinamukkala	MPT	79.0659	15.9284	NREGS
136	Peda dornala	Thimmapuram	MPT	79.0978	15.8886	NREGS
137	Nallaguntla	Nallaguntla	MPT	78.9170	15.8569	NREGS
138	Yadavalli	Yadavalli	MPT	79.0629	15.9188	IWMP
139	Peda dornala	Ayinamukkala	MPT	79.0659	15.9284	IWMP
140	Peda dornala	Thimmapuram	MPT	79.0978	15.8886	IWMP
141	China dornala	China Dornala	PT	79.1076	15.8738	NREGS
142	Chinagudipadu	Chinagudipadu	PT	79.1512	15.9143	NREGS
143	Jammidornala	Jammidornala	PT	79.1400	15.9270	NREGS
144	Kata kani palli	Kata Kani Palli	PT	79.1088	15.8552	NREGS
145	Peda bommala puram	Peda Bommala Puram	PT	79.0956	15.9428	NREGS
146	Peda bommala puram	Peda Bommala Puram	PT	79.0945	15.9430	NREGS
147	Peda dornala	Ayinamukkala	PT	79.0495	15.9311	NREGS
148	Peda dornala	Ayinamukkala	PT	79.0443	15.9301	NREGS
149	Nallaguntla	Nallaguntla	PT	78.8937	15.8568	NREGS
150	Chinagudipadu	Chinagudipadu	PT	79.1512	15.9143	IWMP
151	Peda dornala	Ayinamukkala	PT	79.0495	15.9311	IWMP
152	Peda dornala	Ayinamukkala	PT	79.0443	15.9301	IWMP

PROPOSED ARTIFICIAL RECHARGE STRUCTURES
DORNALA MANDAL, PRAKASHAM DISTRICT, AP.

.S. No.	Mandal	Lattitude	Longitude	Structuretype
1	Dornala	15.8201	78.8266	Checkdam
2	Dornala	15.7958	78.8272	Checkdam
3	Dornala	15.7991	78.8365	Checkdam
4	Dornala	15.8045	78.8445	Checkdam
5	Dornala	15.8056	78.8471	Checkdam
6	Dornala	15.7971	78.8500	Checkdam
7	Dornala	15.8010	78.8514	Checkdam
8	Dornala	15.8027	78.8184	Checkdam
9	Dornala	15.7967	78.8140	Checkdam
10	Dornala	15.8163	78.8224	Checkdam
11	Dornala	15.8215	78.8288	Checkdam
12	Dornala	15.8292	78.8401	Checkdam
13	Dornala	15.8346	78.8508	Checkdam
14	Dornala	15.8354	78.8564	Checkdam
15	Dornala	15.8339	78.8576	Checkdam
16	Dornala	15.8316	78.8536	Checkdam
17	Dornala	15.8122	78.8532	Checkdam
18	Dornala	15.8060	78.8520	Checkdam
19	Dornala	15.8000	78.8795	Checkdam
20	Dornala	15.8062	78.8849	Checkdam
21	Dornala	15.8151	78.8948	Checkdam
22	Dornala	15.8203	78.9070	Checkdam
23	Dornala	15.8312	78.9183	Checkdam
24	Dornala	15.8323	78.9068	Checkdam
25	Dornala	15.8420	78.8912	Checkdam
26	Dornala	15.8288	78.8857	Checkdam
27	Dornala	15.8275	78.8964	Checkdam
28	Dornala	15.8242	78.8883	Checkdam
29	Dornala	15.8246	78.8270	Checkdam
30	Dornala	15.8441	78.8154	Checkdam
31	Dornala	15.8766	78.8415	Checkdam
32	Dornala	15.8968	78.8620	Checkdam
33	Dornala	15.9134	78.8849	Checkdam
34	Dornala	15.9200	78.8982	Checkdam
35	Dornala	15.9242	78.9123	Checkdam
36	Dornala	15.9339	78.9292	Checkdam
37	Dornala	15.9443	78.9444	Checkdam
38	Dornala	15.9494	78.9545	Checkdam
39	Dornala	15.9536	78.9637	Checkdam
40	Dornala	15.9544	78.9778	Checkdam

41	Dornala	15.9579	79.0100	Checkdam
42	Dornala	15.9471	78.9770	Checkdam
43	Dornala	15.9385	78.9557	Checkdam
44	Dornala	15.9149	78.9726	Checkdam
45	Dornala	15.8952	78.9481	Checkdam
46	Dornala	15.8913	78.9235	Checkdam
47	Dornala	15.8875	78.9099	Checkdam
48	Dornala	15.8797	78.8930	Checkdam
49	Dornala	15.8724	78.8817	Checkdam
50	Dornala	15.8790	78.8290	Checkdam
51	Dornala	15.9219	78.8773	Checkdam
52	Dornala	15.9401	78.9074	Checkdam
53	Dornala	15.9544	78.9292	Checkdam
54	Dornala	15.9587	78.9460	Checkdam
55	Dornala	15.9676	78.9356	Checkdam
56	Dornala	15.9571	78.9074	Checkdam
57	Dornala	15.9231	78.9284	Checkdam
58	Dornala	15.9436	79.0023	Checkdam
59	Dornala	15.9366	78.9782	Checkdam
60	Dornala	15.9157	78.9786	Checkdam
61	Dornala	15.8708	79.0799	Checkdam
62	Dornala	15.8155	79.0265	Checkdam
63	Dornala	15.8256	78.9782	Checkdam
64	Dornala	15.8155	78.9718	Checkdam
65	Dornala	15.8205	78.9589	Checkdam
66	Dornala	15.8144	78.9420	Checkdam
67	Dornala	15.7846	78.9818	Checkdam
68	Dornala	15.8144	79.0152	Checkdam
69	Dornala	15.7873	79.0815	Checkdam
70	Dornala	15.7850	79.1113	Checkdam
71	Dornala	15.7997	79.1057	Checkdam
72	Dornala	15.8213	79.0731	Checkdam
73	Dornala	15.8178	79.0542	Checkdam
74	Dornala	15.8395	79.0848	Checkdam
75	Dornala	15.8550	79.0928	Checkdam
76	Dornala	15.8418	79.0574	Checkdam
77	Dornala	15.8643	79.0164	Checkdam
78	Dornala	15.8561	78.9999	Checkdam
79	Dornala	15.8600	78.9746	Checkdam
80	Dornala	15.8658	78.9686	Checkdam
81	Dornala	15.8743	78.8632	Checkdam
82	Dornala	15.8577	78.8471	Checkdam
83	Dornala	15.7942	79.0554	Checkdam

84	Dornala	15.7884	79.0570	Checkdam
85	Dornala	15.7811	79.0984	Checkdam
86	Dornala	15.7648	79.1254	Checkdam
87	Dornala	15.7788	79.1531	Checkdam
88	Dornala	15.7749	79.1414	Checkdam
89	Dornala	15.7559	79.0634	Checkdam
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92	Dornala	15.7289	79.0361	Checkdam
93	Dornala	15.7211	79.0100	Checkdam
94	Dornala	15.7575	79.0011	Checkdam
95	Dornala	15.7436	78.9995	Checkdam
96	Dornala	15.7884	79.0409	Checkdam
97	Dornala	15.8004	79.0659	Checkdam
98	Dornala	15.8031	79.0872	Checkdam
99	Dornala	15.8174	78.9790	Checkdam
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103	Dornala	15.7946	79.1559	Checkdam
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113	Dornala	15.7227	79.1338	Checkdam
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116	Dornala	15.7447	79.1559	Checkdam
117	Dornala	15.6789	79.1117	Checkdam
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119	Dornala	15.9734	78.9324	Checkdam
120	Dornala	15.9869	78.9324	Checkdam
121	Dornala	15.9915	78.9702	Checkdam
122	Dornala	15.9788	79.0092	Checkdam
123	Dornala	15.9637	79.0261	Checkdam
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125	Dornala	15.9660	79.0739	Checkdam
126	Dornala	15.9602	79.1077	Checkdam

127	Dornala	15.9563	79.0779	Checkdam
128	Dornala	15.9103	78.9621	Checkdam
129	Dornala	15.9002	78.9428	Checkdam
130	Dornala	15.9656	78.9975	Checkdam
131	Dornala	15.9648	79.0063	Checkdam
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136	Dornala	15.9262	79.0019	Checkdam
137	Dornala	15.9246	78.9935	Checkdam
138	Dornala	15.9304	78.9545	Checkdam
139	Dornala	15.9014	78.9380	Checkdam
140	Dornala	15.8991	78.9267	Checkdam
141	Dornala	15.9080	78.8942	Checkdam
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171	Dornala	15.8596	79.0538	Checkdam
172	Dornala	15.8677	79.0445	Checkdam
173	Dornala	15.7482	79.1149	Checkdam
174	Dornala	15.8236	79.1016	Checkdam
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177	Dornala	15.8101	78.8270	Checkdam
178	Dornala	15.8507	78.8857	Checkdam
179	Dornala	15.8639	78.8339	Checkdam
180	Dornala	15.8132	78.8105	Checkdam
181	Dornala	15.8817	78.9983	Checkdam
182	Dornala	15.8555	78.9051	Percolation Tank
183	Dornala	15.8691	78.9305	Percolation Tank
184	Dornala	15.8740	78.9547	Percolation Tank
185	Dornala	15.8617	78.9437	Percolation Tank
186	Dornala	15.8419	78.9245	Percolation Tank
187	Dornala	15.9219	78.9046	Percolation Tank
188	Dornala	15.9183	78.9214	Percolation Tank
189	Dornala	15.8818	78.8437	Percolation Tank
190	Dornala	15.9524	78.9854	Percolation Tank
191	Dornala	15.9558	78.9917	Percolation Tank
192	Dornala	15.9524	78.9171	Percolation Tank
193	Dornala	15.9616	78.9399	Percolation Tank
194	Dornala	15.8963	78.9677	Percolation Tank
195	Dornala	15.9300	79.0284	Percolation Tank
196	Dornala	15.9136	79.0878	Percolation Tank
197	Dornala	15.8871	79.0931	Percolation Tank
198	Dornala	15.8940	79.1154	Percolation Tank
199	Dornala	15.8853	79.0574	Percolation Tank
200	Dornala	15.8924	79.0404	Percolation Tank
201	Dornala	15.9169	79.0255	Percolation Tank
202	Dornala	15.8770	79.1492	Percolation Tank
203	Dornala	15.8419	79.1706	Percolation Tank
204	Dornala	15.8458	79.0921	Percolation Tank
205	Dornala	15.8417	79.0538	Percolation Tank
206	Dornala	15.8493	79.0204	Percolation Tank
207	Dornala	15.8165	79.0816	Percolation Tank
208	Dornala	15.8154	79.0406	Percolation Tank
209	Dornala	15.8161	78.9833	Percolation Tank
210	Dornala	15.7995	79.0979	Percolation Tank
211	Dornala	15.7769	79.0907	Percolation Tank
212	Dornala	15.7630	79.0977	Percolation Tank

213	Dornala	15.7879	79.0248	Percolation Tank
214	Dornala	15.7612	79.1298	Percolation Tank
215	Dornala	15.7794	79.1619	Percolation Tank
216	Dornala	15.7418	79.0835	Percolation Tank
217	Dornala	15.7619	79.0830	Percolation Tank
218	Dornala	15.7616	79.0691	Percolation Tank
219	Dornala	15.7529	79.0238	Percolation Tank
220	Dornala	15.7365	79.0121	Percolation Tank
221	Dornala	15.7213	79.0159	Percolation Tank
222	Dornala	15.8394	78.9970	Percolation Tank
223	Dornala	15.8188	79.0609	Percolation Tank
224	Dornala	15.8002	79.0618	Percolation Tank
225	Dornala	15.7879	79.0761	Percolation Tank
226	Dornala	15.7646	79.0938	Percolation Tank
227	Dornala	15.7387	79.0683	Percolation Tank
228	Dornala	15.7728	79.0116	Percolation Tank
229	Dornala	15.7454	79.0616	Percolation Tank
230	Dornala	15.7109	79.0370	Percolation Tank
231	Dornala	15.7339	79.0948	Percolation Tank
232	Dornala	15.8403	79.0709	Percolation Tank
233	Dornala	15.8675	79.0672	Percolation Tank
234	Dornala	15.8864	79.0646	Percolation Tank
235	Dornala	15.8735	79.0624	Percolation Tank
236	Dornala	15.9923	78.9847	Percolation Tank
237	Dornala	15.9814	79.0169	Percolation Tank
238	Dornala	15.9636	79.0631	Percolation Tank
239	Dornala	15.9561	79.0525	Percolation Tank
240	Dornala	15.9455	79.0410	Percolation Tank
241	Dornala	15.9450	79.0254	Percolation Tank
242	Dornala	15.9584	79.0828	Percolation Tank
243	Dornala	15.9388	79.1167	Percolation Tank
244	Dornala	15.9194	79.1087	Percolation Tank
245	Dornala	15.8829	79.0905	Percolation Tank
246	Dornala	15.8591	79.0504	Percolation Tank
247	Dornala	15.8071	78.9919	Percolation Tank

Fig.1

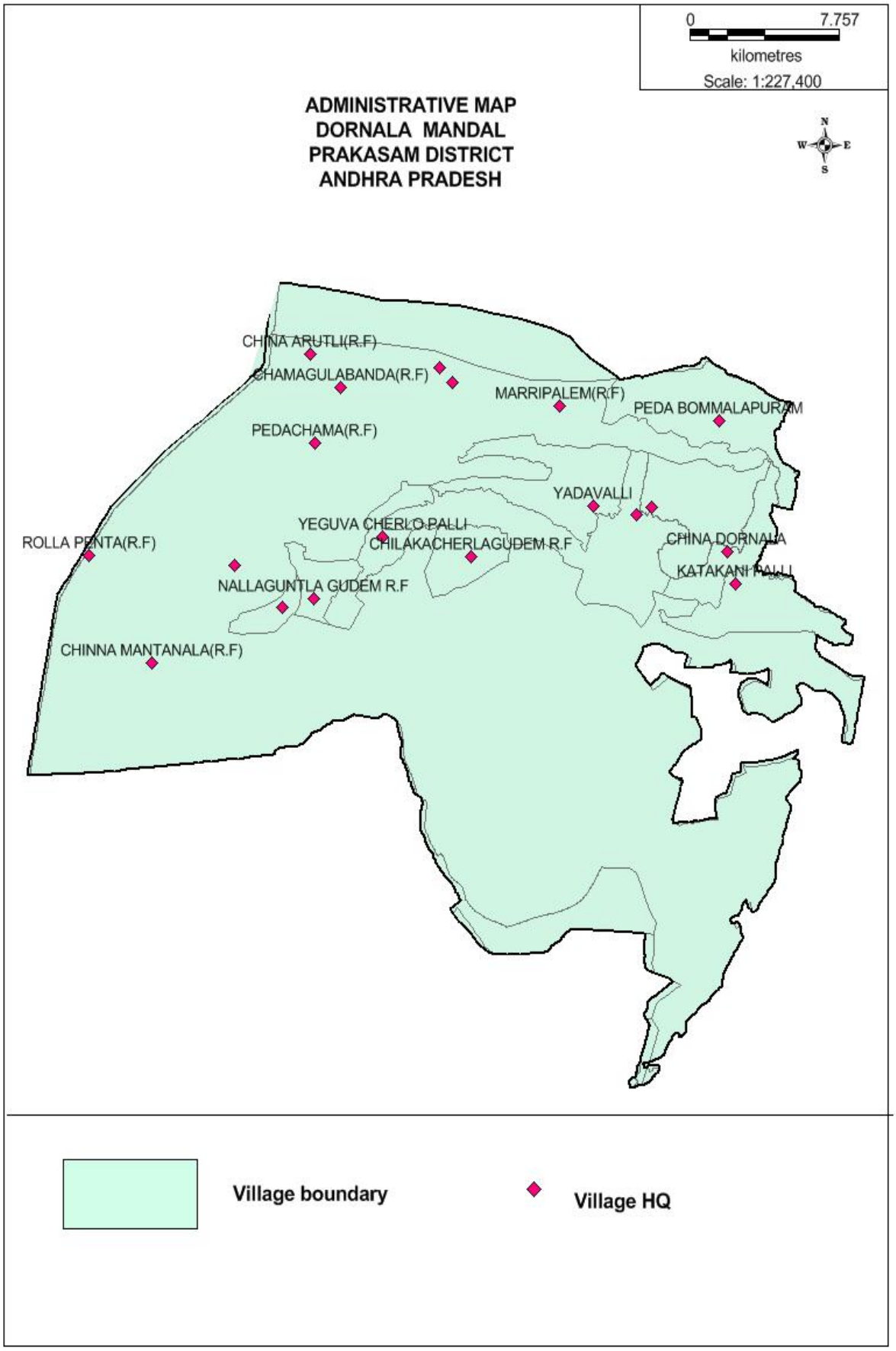

0
7.757
kilometres
Scale: 1:227,400
ADMINISTRATIVE MAP
DORNALA MANDAL
PRAKASAM DISTRICT
ANDHRA PRADESH
N
W
E
S
CHINA ARUTLI(R.F)
CHAMAGULABANDA(R.F)
MARRIPALEM(R.F)
PEDA BOMMALAPURAM
PEDACHAMA(R.F)
YADAVALLI
YEGUVA CHERLO PALLI
CHILAKACHERLAGUDEM R.F
ROLLA PENTA(R.F)
CHINA DORNALA
KATAKANI PALLI
NALLAGUNTLA GUDEM R.F
CHINNA MANTANALA(R.F)
Village boundary
Village HQ

Fig.2

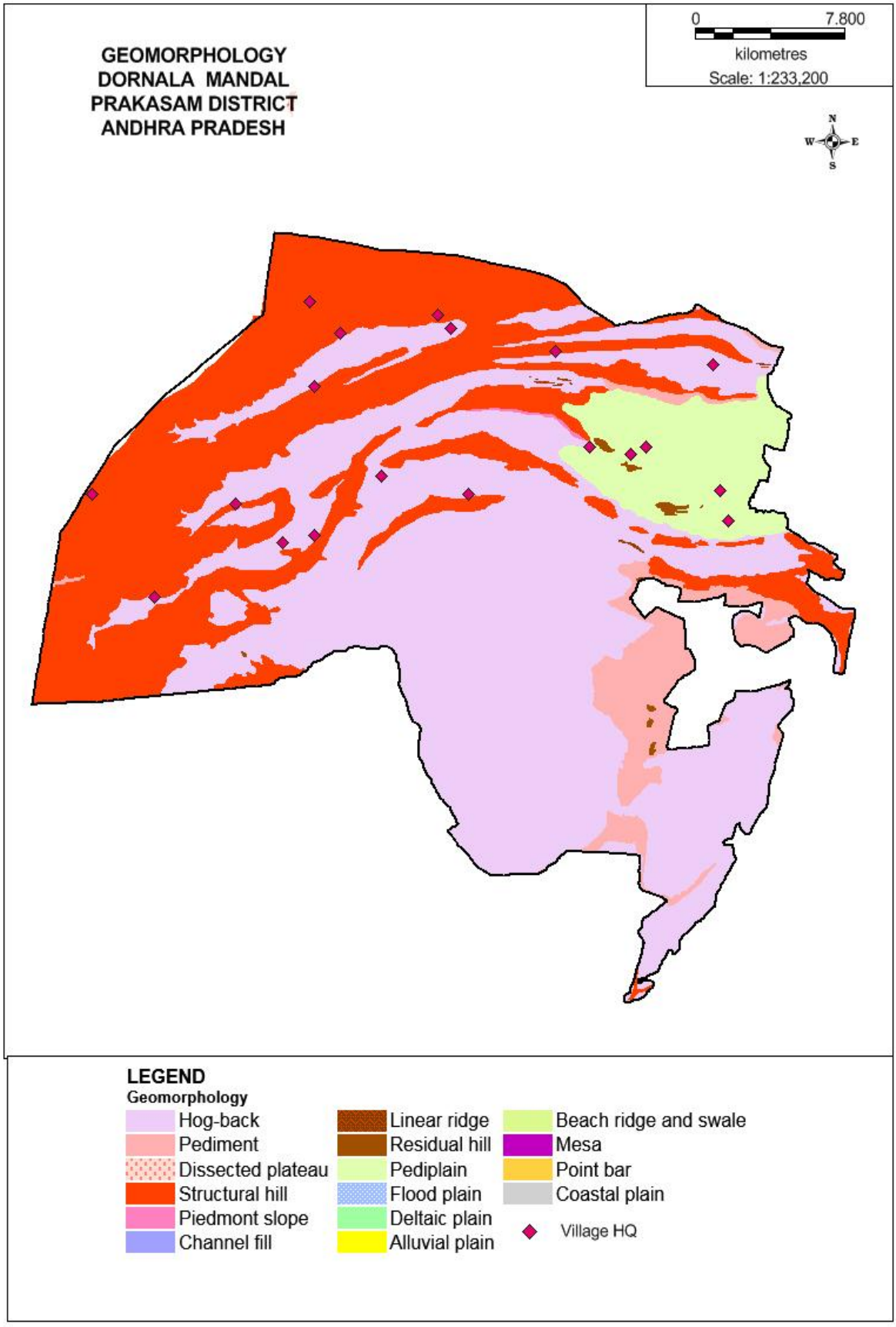

GEOMORPHOLOGY
DORNALA MANDAL
PRAKASAM DISTRICT
ANDHRA PRADESH
0
7.800
kilometres
Scale: 1:233,200
N
W
E
S
LEGEND
Geomorphology
Hog-back
Pediment
Dissected plateau
Structural hill
Piedmont slope
Channel fill
Linear ridge
Residual hill
Pediplain
Flood plain
Deltaic plain
Alluvial plain
Beach ridge and swale
Mesa
Point bar
Coastal plain
Village HQ

Fig.3

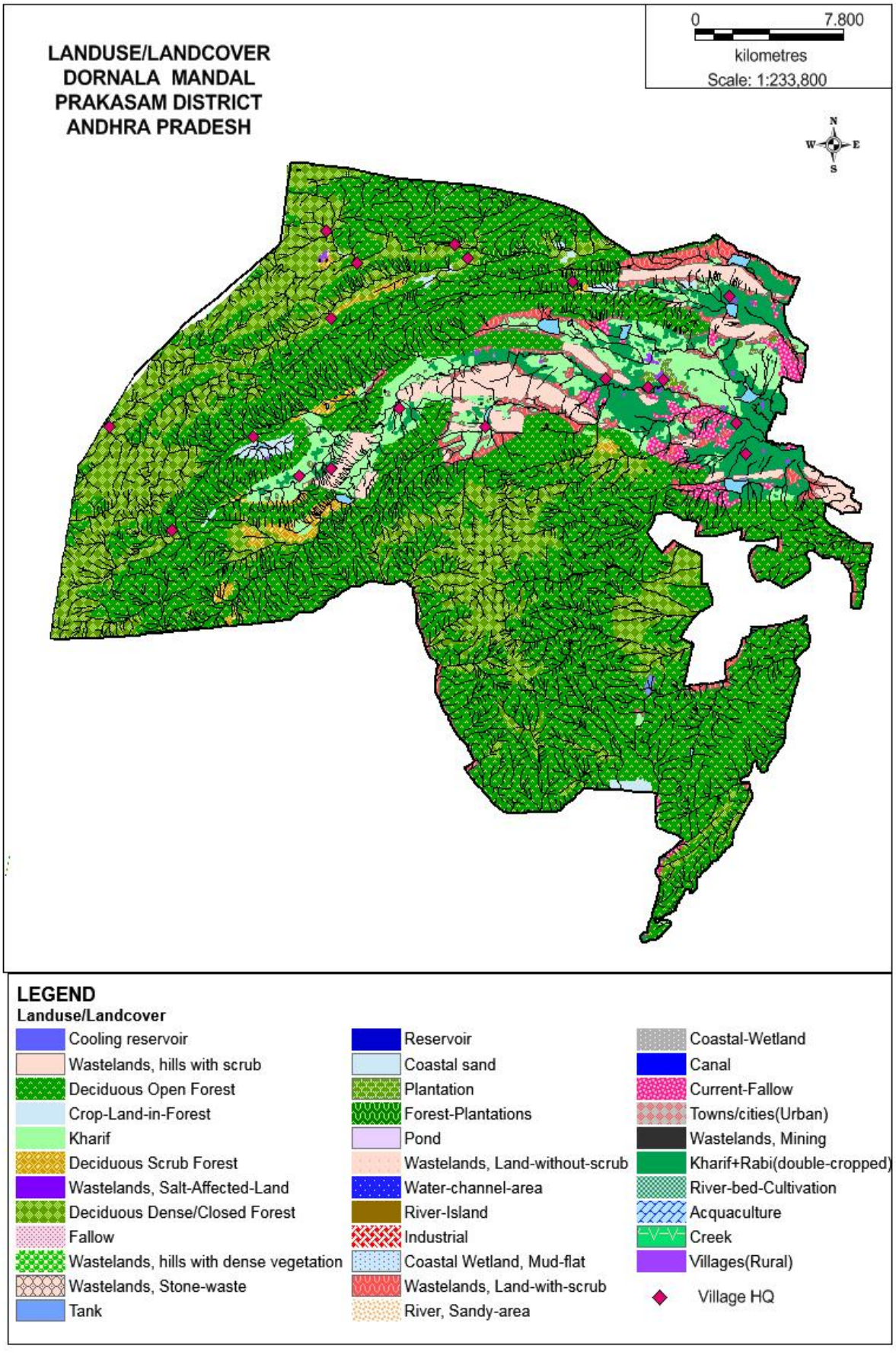

LANDUSE/LANDCOVER
DORNALA MANDAL
PRAKASAM DISTRICT
ANDHRA PRADESH
0
7.800
kilometres
Scale: 1:233,800
N
W
E
S
LEGEND
Landuse/Landcover
Cooling reservoir
Wastelands, hills with scrub
Deciduous Open Forest
Crop-Land-in-Forest
Kharif
Deciduous Scrub Forest
Wastelands, Salt-Affected-Land
Deciduous Dense/Closed Forest
Fallow
Wastelands, hills with dense vegetation
Wastelands, Stone-waste
Tank
Reservoir
Coastal sand
Plantation
Forest-Plantations
Pond
Wastelands, Land-without-scrub
Water-channel-area
River-Island
Industrial
Coastal Wetland, Mud-flat
Wastelands, Land-with-scrub
River, Sandy-area
Coastal-Wetland
Canal
Current-Fallow
Towns/cities(Urban)
Wastelands, Mining
Kharif+Rabi(double-cropped)
River-bed-Cultivation
Acquaculture
Creek
Villages(Rural)
Village HQ

Fig.4

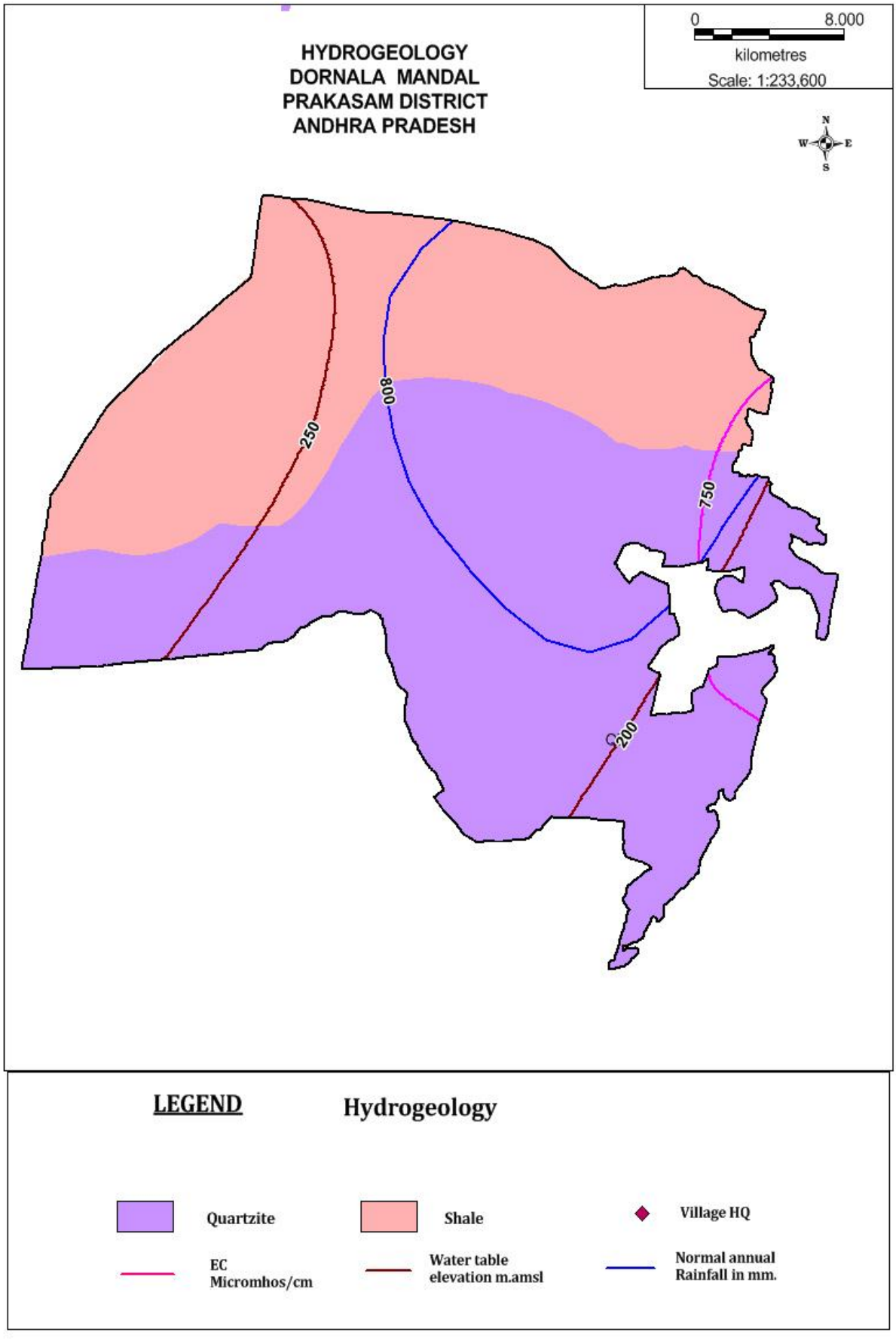
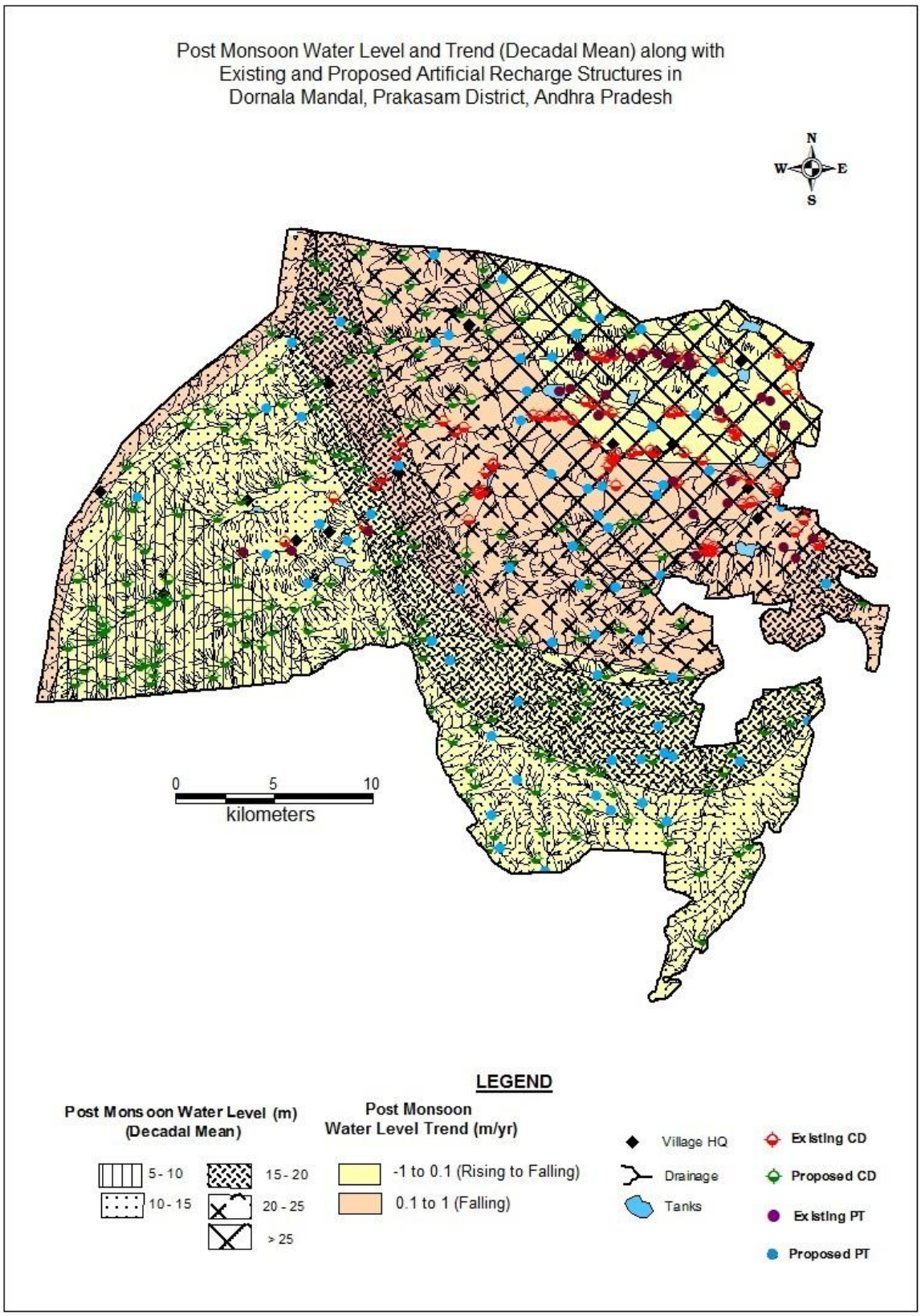

HYDROGEOLOGY
DORNALA MANDAL
PRAKASAM DISTRICT
ANDHRA PRADESH
0
8.000
kilometres
Scale: 1:233,600
N
W
E
S
250
800
750
200
LEGEND
Hydrogeology
Quartzite
Shale
Village HQ
EC
Micromhos/cm
Water table
elevation m.amsl
Normal annual
Rainfall in mm.

Fig.5


Post Monsoon Water Level and Trend (Decadal Mean) along with
Existing and Proposed Artificial Recharge Structures in
Dornala Mandal, Prakasam District, Andhra Pradesh
N
W
E
S
0
5
10
kilometers
LEGEND
Post Monsoon Water Level (m)
(Decadal Mean)
5 - 10
10 - 15
15 - 20
20 - 25
> 25
Post Monsoon
Water Level Trend (m/yr)
-1 to 0.1 (Rising to Falling)
0.1 to 1 (Falling)
Village HQ
Drainage
Tanks
Existing CD
Proposed CD
Existing PT
Proposed PT